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Nuclear reactions in the laboratory and the cosmos: A few-body perspective

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Rare isotopes play an important role in stellar environments, but for understanding their properties and reactions it is crucial to study them in the laboratory. Facilities in many countries have been or are in the process of being upgraded or newly built, and the physics community prepares to address the challenging science. A large fraction of the physics programs involve direct reactions with rare isotope beams, reactions which leave a good part of the beam nuclei intact.

Over the last decade tremendous progress has been made in exact descriptions of the structure of nuclei as well as in reaction involving few nuclei. However the upcoming theoretical challenge for rare isotopes physics will be microscopic descriptions of nuclear reactions for light as well as heavy isotopes and take advantage of the achievements made in the description of the structure of those isotopes.

This talk will focus on reactions which assume that only a few degrees of freedom are active. This makes them perfect candidates to be addressed with well known few-body methods, and will discuss challenges that arise when casting a many-body problem into a few-body problem.